Chemical Tests

Chemical analysis plays an important part in the categorisation of cements and other construction materials such as lime. The use of analytical instrumentation such as flame photometry offers a simple and cost effective solution to the determination of the constituent parts of cement.

Flame Photometry

This technique is particularly effective for determining the alkali content of cement. The alkali elements can be thermally dissociated in a flame and the atoms excited to a higher energy level. When returning to the ground state, they emit radiation at a characteristic wavelength which is specific to each element.

ELE Flame Photometer

EN196-21; ASTM C114, Test 17

The ELE Flame Photometer is built to a high specification and can be used with confidence for the most exacting analysis. It is a low temperature, single channel emission flame photometer with a large clear digital readout. The unit incorporates zero and gain controls with fine and coarse sensitivity; electronic ignition and automatic air supply regulation.

The meter is supplied with sodium and potassium filters, fuel and air connections, nebuliser cleaning wire, hose connecting clips, auxiliary power plug, hexagon key, 2 lengths of drain tubing and a comprehensive instruction book and service manual. The unit is housed in a strong case.

Specification		
Dimensions (l x w x h)		420 x 360 x 300 mm
Readout		LED three 12.5 mm digits
Range		0 to 199.9 ppm
Sensitivity	*Na*	3 to 100 ppm
	K	3 to 100 ppm
	Ca	5 to 100 ppm *(optional filter)*
Reproducibility		1 % CV for 20 consecutive samples using 10 ppm, set to read 100
Recorder output		Nominal 1.00 V for a reading of 100.0
Weight		8 kg

Ordering Information

EL38-0200/01
ELE Flame Photometer
For 220 – 240 V AC, 50 – 60 Hz, 1 ph.

Special Note:
The Flame Photometer requires a source of moisture-free air at 6 litres/minute at a pressure of 1 kg/cm². It also requires a fuel source for the flame and a regulator (see accessories).

EL38-0200 ELE Flame Photometer

Accessories

EL38-0320/01 **Air Compressor.** Supplies air at 6 litres/minute at a pressure of 1 kg/cm², for use with EL38-0200/01 Flame Photometer. *Weight 4 kg.*
For 220 – 240 V AC, 50 – 60 Hz, 1 ph.

Filters		*Regulators*	
Model number	*Description*	*Model number*	*Description*
EL38-0250	Calcium	EL38-0280	for Propane Gas

Loss-on-Ignition

EN196-2, EN459-2

The Loss-on-Ignition of Cement and Building Lime can be determined using a Muffle Furnace to oxidize the sample in air at 975 ±25ºC.

Muffle Furnace *see Laboratory Equipment Section*

Crucibles *see Laboratory Equipment Section*

Muffle Furnace with Accessories

Fineness

The fineness of cement is a property, which must be carefully controlled during the manufacturing process. The total specific surface of the cement represents the surface area available for hydration. Various methods are in use to measure the specific surface of cements. For most purposes air permeability methods produce accurate, repeatable results.

Determination of Particle Size Rigden's Flow Meter

BS 4359-2, BS 6463-103

Ordering Information

EL38-0500
Rigden's Flow Meter comprising a case, calibrated U-tube, connecting assembly and isolating taps. An aspirator is supplied with the apparatus together with bung to accept EL38-0600 Permeability Cell.
Supplied *without* cell. *Weight 5.5 kg*

Accessories

EL38-0600	**Permeability Cell** made of stainless steel. *Weight 500 g*
EL38-0620	**Manometer Liquid** (Dibutylphthalate) 500 ml bottle.
EL38-0630	**Filter Papers,** 32 mm diameter. Box of 100.
EL38-0640	**Reference Cement**. 10 g sachet.

Determination of Fineness Blaine Apparatus

EN 196-6, 459-2, 13286-44; BS 4359-2; ASTM C204

This method has been adopted in Europe as the definitive means of determining the fineness of cement and other 'powder' materials.

The system is supplied complete with stainless steel cell, perforated disc and plunger, manometer U-tube, aspirator, bottle of manometer liquid and a box of filter papers.

Ordering Information

EL38-1000
Blaine Air Permeability Apparatus *Weight 2.8 kg*

Accessories

EL38-0650	**Filter Papers**, 12.7 mm diameter. Box of 100.
	Manometer Liquid (Dibutylphthalate) *see EL38-0620*
	Reference Cement *see EL38-0640*

Spares

EL38-1000/10	**Manometer U-tube**
EL38-1000/15	**Blaine Air Permeability Cell** stainless steel with a perforated disc and plunger.

Specific Gravity (relative density) of Hydraulic Cement

ASTM C188; AASHTO T133

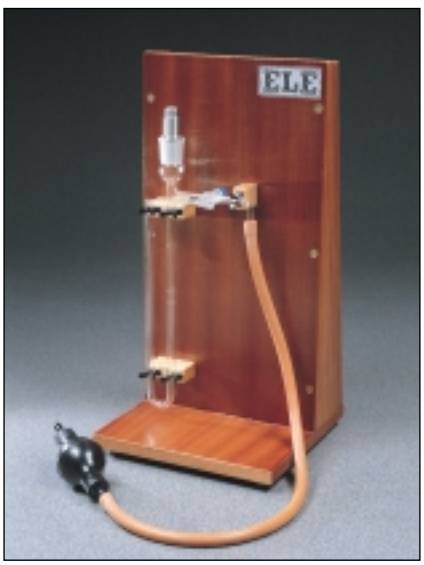
It is necessary to know the specific gravity of cement for various reasons related to its quality and use. In particular it will be necessary to determine the specific gravity as part of the determination of the specific surface of a cement.

Ordering Information

EL38-1200
Le Chatelier Flask for determining the density of hydraulic cement and lime. Capacity 250 ml. Graduated from 0 to 1 ml and from 18 to 24 ml graduations. Accurate to 0.05 ml. *Weight 0.5 kg*

EL38-0500 Rigden's Apparatus with EL38-0600 Permeability Cell

EL38-1000 Blaine Apparatus



EL38-1200 Le Chatelier Flask

Consistence Setting Time, Workability and Flow

Determination of setting time and soundness of cement requires the use of a neat cement paste of standard consistence. The Vicat method is usually specified as the test used to determine the water content which will produce the desired consistence.

The consistence of fresh mortars, lime and masonry cements is determined by a Plunger Penetration Method.

Vicat Method

EN 196-3, 13454-2; ASTM C187, C191

This procedure is used to determine the quantity of water required to produce a cement paste of standard consistence.

Ordering Information

EL38-2010
Vicat Frame complete with consistency plunger, 10 mm diameter. Requires one initial or final set needle to make up test weight to 300 g. Weight 1.3 kg

Accessories

EL38-2110	**EN Initial Set Needle** 1.13 mm diameter. *Weight 9 g*
EL38-2150	**EN Final Set Needle** 1.13 mm diameter with special footing. *Weight 9 g*
EL38-2620	**ASTM Initial Set Needle** 1 mm diameter. *Weight 9 g*
EL38-2200	**Vicat Mould** manufactured from brass and supplied complete with a ring and glass base plate. *Weight 800 g*
EL38-2300	**EN Vicat Mould** manufactured from a hard rubber compound and supplied complete with a glass base plate. *Weight 500 g*
EL38-2660	**ASTM Vicat Mould** manufactured from non-absorbent plastic and supplied complete with a glass base plate. *Weight 200 g*

Spare

EL38-2010/10	**Consistency Plunger**

Automatic Vicat

EN 196-3, 13454-2; ASTM C187, C191

The Automatic Vicat Apparatus executes the test program using a fully automatic test cycle. The integral LCD display indicates test progress in real time. Firmware in the unit enables up to five user test profiles to be established. Integrated on-board memory will store up to 50 complete tests. On completion of the test the integral printer automatically prints all test data including a graph penetration with related data. As standard, the unit includes an RS232 serial port for connection to PC which when used in conjunction with the accessory software (EL38-2015/10) enables users to manage test data including graphing and report generation. The timed cycle of events is operator-selectable and penetrations can be selectable at intervals of 30 seconds, 1, 5, 15 or 30 minutes.

Ordering Information

EL38-2015/01
Automatic Vicat Apparatus complete with EN and ASTM Initial and Final needles, Consistency Plunger, 1 x EN and ASTM Mould and Glass Plate. Suitable for continuous use in saturated humidity, at a controlled temperature of 20°C ± 1°C. *Weight 13 kg*
For 220 – 240 V AC, 50 – 60 Hz, 1 ph

Accessories

EL38-2015/10	**Windows Software and RS232 Cable**
EL38-2015/12	**Needle Cleaning Device**
EL38-2015/14	**Printer Paper Rolls**, pack of 10
EL38-2015/15	**Mould Tank** for testing samples under water as per EN 196-3, for use in temperature controlled laboratories.
EL38-2016/01	**Thermostatically-controlled Heating/Cooling System**, for testing samples under water as per EN 196-3. 220 – 240 V AC, 50 Hz, 1 ph

Spares

EL38-2015/16	**Consistency Plunger**
EL38-2021	**EN Initial Set Needle**, 1.13 mm dia
EL38-2022	**EN Final Set Needle**, 1.13 mm dia
EL38-2023	**ASTM Initial Set Needle**, 1 mm dia
EL38-2024	**ASTM Final Set Needle** 1 mm dia
Moulds	*see EL38-2200, EL38-2300 or EL38-2660*

EL38-2010 Vicat Apparatus and Accessories

38-2015/15 Mould Tank

EL38-2016/01

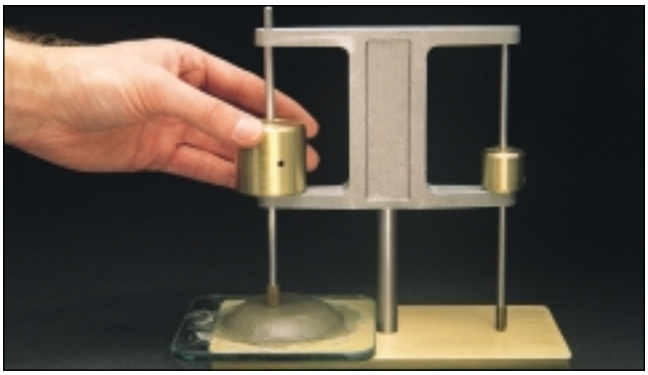
EL38-2015/01 Automatic Vicat Apparatus

Gillmore Method

ASTM C266; AASHTO T154

Ordering Information

EL38-2690
Gillmore Apparatus used to determine the time of set of cement. Apparatus consists of one needle point of each size, base, support shaft and horizontal arms. *Weight 2.5 kg*



EL38-2690 Gillmore Apparatus

Concrete Mortar Penetrometer

The Concrete Mortar Penetrometer is used for field and laboratory evaluations of the initial set of concrete mortars. The test involves inserting the penetrometer shaft to a depth of 25.4 mm at constant rate and time interval. The resistance in lbf/in² is shown on the penetrometer's direct-reading scale.

Specification	
Dimensions	19 x 178 mm *(diameter x length)*
Shaft needle	Steel, 1/20 in² surface area
Range	0 to 700 lbf/in²
Scale	Direct-reading, indicator sleeve holds reading until released
Weight	227 g

Ordering Information

EL38-2695
Pocket Concrete Penetrometer supplied complete with belt-loop, canvas carrying case.

Consistence by Dropping Ball

BS 4551-1

The consistence of fresh mortar is determined by dropping a ball of specified weight a set distance and measuring the resulting penetration into the fresh mortar. The apparatus comprises a dropping mechanism and mould 100 mm diameter x 25 mm deep.

Ordering Information

EL38-5000
Dropping Ball Apparatus *Weight 6 kg*

Accessory

EL38-5200 **Ball Penetration Measuring Apparatus** comprising a tripod and dial gauge graduated in 0.1 mm divisions x 25 mm. *Weight 800 g*

Plunger Penetration

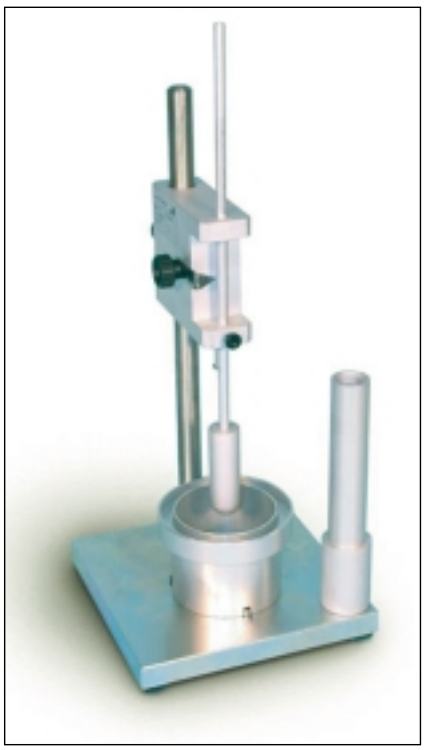
EN 413-2, 459-2, 1744-1, 11015-4; DIN 4211

- ***Complies with EN standards***
- ***Positive lock/release mechanism***
- ***Fully adjustable height setting***
- ***Accurate determination of penetration***

For determining the consistency of masonry cement. The method has been introduced into EN standards for fresh mortar, lime and masonry cement. A simple yet accurate measuring scale gives readability to better than 0.5 mm. The unit is supplied complete with test cup and tamper.

Ordering Information

EL38-2705
ELE Plunger Penetration Apparatus *Weight 6 kg*



EL38-2705 ELE Plunger Penetration Apparatus

EL38-5000 Dropping Ball Apparatus with Accessories

Flow and Workability of Mortar and Lime

To perform this test, a sample is placed on a metal surface which is then raised and dropped through a known height. The apparatus and methods of test are all similar.

Flow of Mortars and Hydraulic Cement

BS 4551-1, 3892-1; ASTM C230

Ordering Information

EL38-6000
Flow Table Top manufactured from cast bronze as specified in BS and ASTM C230. Complete with spindle. *Weight 4.1 kg*

EL38-6020
Tripod for Flow Table manufactured from cast iron. *Weight 8.6 kg*

EL38-6040
Flow Mould manufactured from bronze as specified in BS and ASTM C230. *Weight 900 g*

EL38-6060
Baseplate for fixing the flow table tripod to a concrete plinth. Manufactured from steel, 25 mm thick x 254 mm square. *Weight 13 kg*

EL38-6080
ASTM Callipers for measuring the diameter of the sample. *Weight 450 g*

EL38-6100/01
Motorising Unit for use with EL38-6020. Operates the cam at a speed of 100 rpm. For 220-240 V AC, 50 Hz, 1 ph. *Weight 5 kg*

EL38-6160
Plastic Tamper

Flow of Mortar

EN 1015-3, 1015-9, 13395-1

Manufactured to satisfy EN requirements, this unit is supplied complete with flow table tripod. Tests are performed by placing a sample on the flow table surface which is then raised and dropped through a known height

Ordering Information

EL38-6300
EN Flow Table comprising Flow Table and Tripod

EL38-6305/01
Motorising Unit, operates Flow Table cam at a speed of 60 rpm. For use on 220 – 240 V, 50 Hz, 1ph

EL38-6310
EN Flow Mould, truncated, 100 mm i.d. at base x 60 mm high

EL38-2702
Tamper 40 mm dia x approx 200 mm long

Vernier Caliper *see EL81-0154*

Trowel *see EL81-0310*

Trimming Knife *see EL81-0710*

BS Flow Table, Tripod, Mould and Baseplate

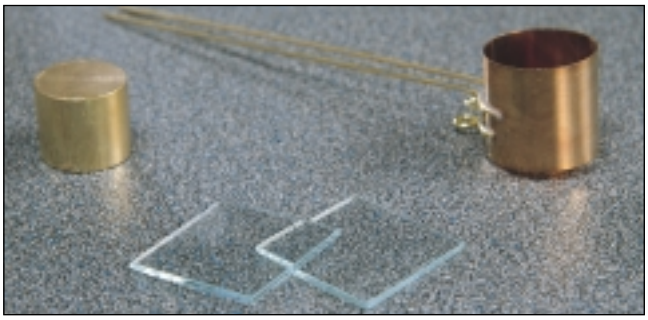
Soundness

The soundness of cement and hydrated lime is of particular importance. It is essential that once hardened the paste does not undergo a large change in volume.

The soundness of cements and limes can be determined by an expansion test using Le Chatelier Moulds. The method of curing lime differs from that of cements, lime being cured in a steam tank and cements in a water bath. The ASTM method uses a high-pressure steam vessel (Autoclave) to cure the specimens.

General Expansion of Dry Hydrated Lime by the Le Chatelier Method;

BS 6463; EN 196-3, 459-2



EL38-3005 Le Chatelier Mould

Ordering Information

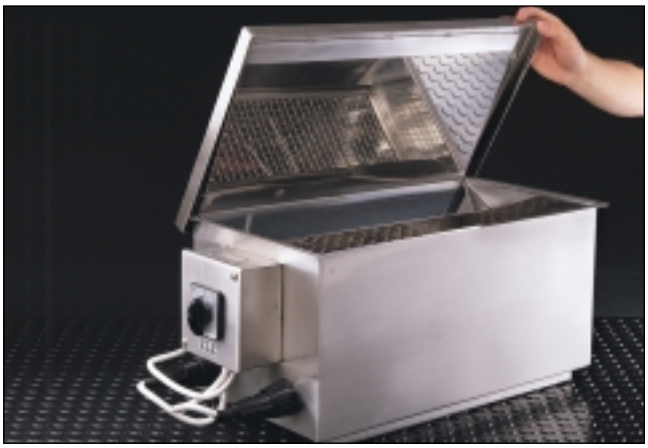
EL38-3005
Le Chatelier Mould comprising a split cylinder fitted with two indicator stems. The mould is supplied complete with two glass plates and a weight 100 g ±10 g. Three moulds required for each test. *Weight 900 g*

EL38-3200
Extensibility of Mould Apparatus, BS 6463. This unit comprises a metal sleeve with a hook and set screw to fit over one of the mould pointers, and a clamp to fit on to the other pointer of the mould. Supplied complete with one weight 100 g ±1 g.

EL38-3300
Tamping Rod, 17 mm end diameter. *Weight 70 g*

EL38-3260/01
Steam Tank for curing specimens in moulds to BS 6463. The tank is made of stainless steel and has a lid fitted with a drip shield. Two heaters are fitted to maintain accurate temperature control. *Weight 14 kg.* For 220 – 240 V AC, 50 – 60 Hz, 1 ph.

EL38-3260/01 Steam Tank



Soundness of Cement Paste by the Le Chatelier Method

EN 196-3, 459-2

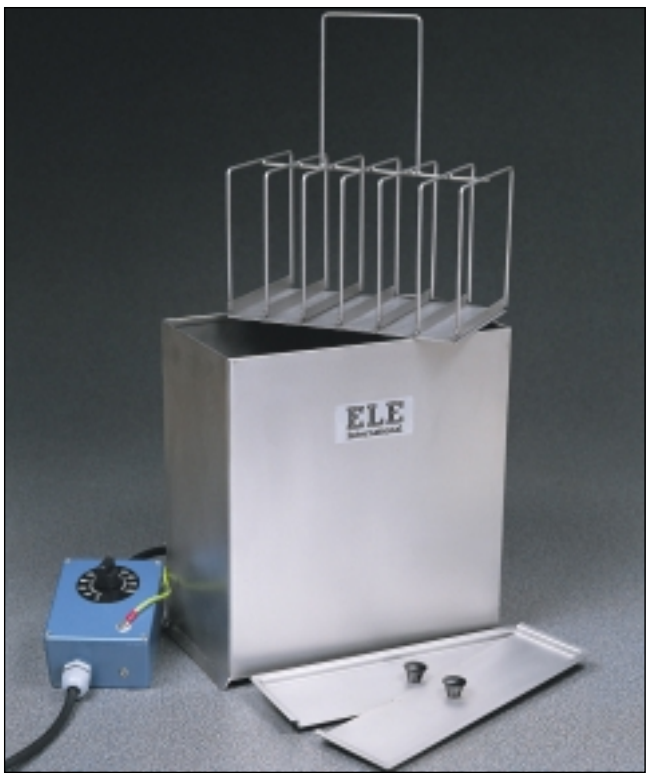
Ordering Information

Le Chatelier Mould *see EL38-3005*

EL38-3205
Extensibility of Mould Apparatus, EN. This unit comprises a metal sleeve with a hook and set screw to fit over one of the mould pointers, and a clamp to fit on to the other pointer of the mould. Le Chatelier moulds should be checked periodically with the unit to check the state of the split cylinder. Supplied complete with one weight 300 g ±1 g.

EL38-3410/01
Le Chatelier Water Bath manufactured from corrosion resistant material, complete with a removable rack to hold up to twelve moulds. An adjustable controller for the immersion heater regulates the water temperature. *Weight 5.4 kg.*
For 220 – 240 V AC, 50 – 60 Hz, 1 ph.

EL38-3410/01 Le Chatelier Water Bath



ELE International has a policy of continuous product review to ensure compliance to the relevant testing standards.

The latest product information can be found on the ELE e-commerce system at ***www.ele.com***

We recommend that you take a few minutes to register for access to this fully integrated and advanced facility for:

- ***Placing and tracking orders anytime 24/7***
- ***Receiving mailings on special offers and new products***
- ***Expanded product specifications***
- ***Downloading available product datasheets***

Soundness of Portland Cement by the Autoclave Method

ASTM C151

Specimens are cured in a high-pressure steam vessel and the change in specimen length is determined using Drying, Shrinkage and Moisture Movement Apparatus.

The Autoclave provides high pressure steam curing of the specimens. The unit conforms to the requirements of ASTM. Supplied complete with safety valve, pressure gauge and thermostat controlled heater unit.

Special Note:
This unit draws a current up to 20 amps.

Ordering Information

EL38-3800/01
Autoclave as specified. *Weight 108 kg*
For 220 – 240 V AC, 50 – 60 Hz, 1 ph.

Accessories

	Two-gang Prism Mould	*see EL34-8544*
	Inserts	*see EL34-8547*

Spares

EL38-3800/13	**Lid Sealing Gasket**
EL38-3800/14	**Heating Element**, 220-110 V AC
EL38-3800/K1	**Spares Kit**, 220 V AC, for Autoclave

EL38-3800/01 Autoclave

Heat of Hydration of Cement

BS 4550; ASTM C186

The Heat of Hydration Apparatus is manufactured to the requirements specified in BS 4550 and ASTM C186. It comprises a Dewar flask, an internally lagged case, a constant speed electric stirrer, filler funnel and a Beckman-type thermometer complete with reader.

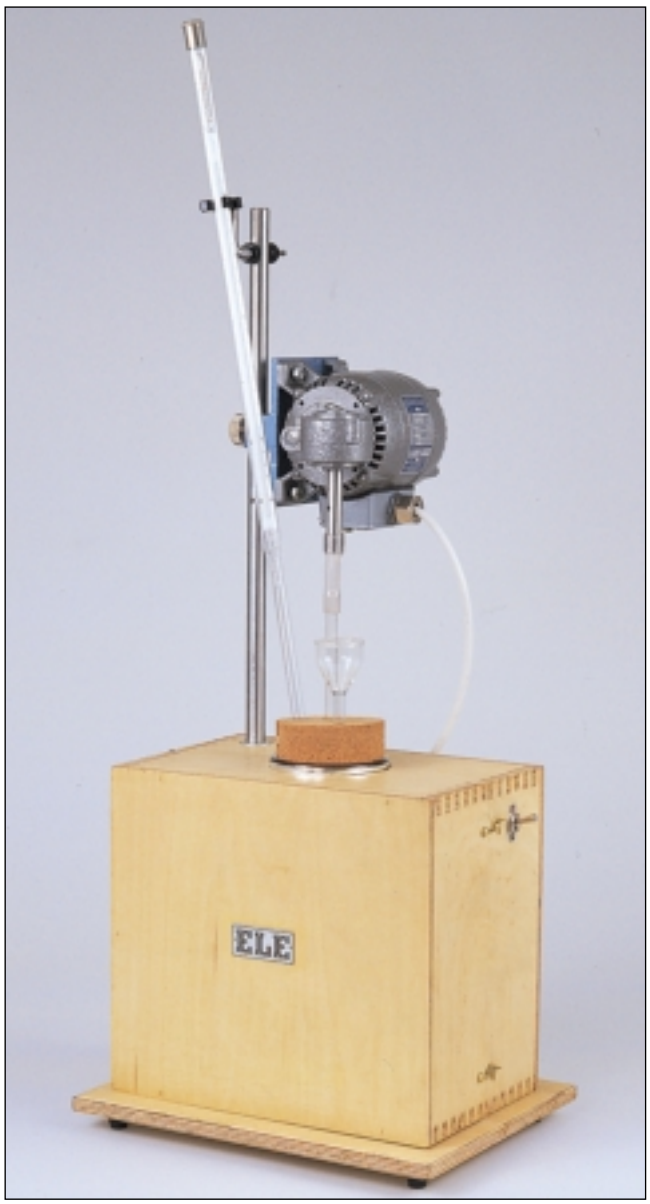
Ordering Information

EL38-4600/01
Heat of Hydration Apparatus *Weight 13 kg*
For 220 – 240 V AC, 50 – 60 Hz, 1 ph

Spares

EL38-4600/10	**Dewar Flask**
EL38-4600/11	**Filling Funnel**
EL38-4600/12	**Beckman Thermometer and Reader Glass,** range 6ºC ±0.01ºC
EL38-4600/13	**Glass Paddle** for Stirrer

EL38-4600 series Heat of Hydration Apparatus



Air Content and Density

Mortars are used for a variety of purposes, the most common being as a bond between brick and blockwork.

Both air content and density are important if durability and strength of mortar is to be adequate. Specifications often require minimum levels of air content and density. The equipment described enables standard tests to be performed on mortars and similar materials.

Air Content of Freshly Mixed Mortars by the Density Method

BS 4551-1

The apparatus required for this test method is simple, although the specific gravity of the constituents and the mix proportions by weight must be known.

Ordering Information

EL38-7000
Metal Measure 500 ml capacity, internal dia 76 mm. *Weight 900 g*

EL38-7060
Glass Plate nominally 100 mm square. *Weight 350 g*

EL38-7080
Hard Plastic Tamper 37.5 ±0.5 mm dia. *Weight 250 g*

Air Content of Mortar, Masonry Cement and Lime by the Pressure Method

EN 413-2 459-2 1015-6, -7; DIN 18555

- ***Direct reading of air content in percent***
- ***Fine control test valves***
- ***Positive sealing, quick release clamps***
- ***Integral air pump***
- ***Heavy duty 1 litre container***

This Air Entrainment Meter is designed to satisfy the requirements of a variety of EN and other standards for testing mortars, limes and masonry cement.

The unit incorporates a large pressure gauge giving direct reading of air content in percent.

Ordering Information

EL38-7092
Air Entrainment Meter 1 litre capacity, complete with integral pump. *Weight 11 kg*

Accessories

Tamper *see EL38-2702*

Air Content of Hydraulic Cement Mortar

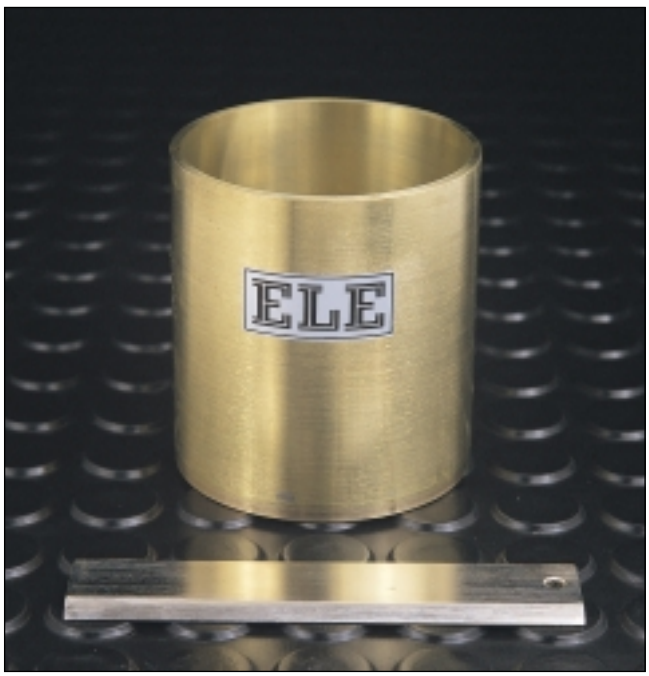
ASTM C185

Ordering Information

EL38-7100
Metal Measure 400 ml capacity. Internal diameter 76 mm x 90 mm deep. *Weight 900 g*

Straight Edge *see EL24-9010*

EL38-7100 Metal Measure shown with Straight Edge



EL38-7092 Air Entrainment Meter

Bulk Density of Lime
EN 459-2

The bulk density of lime is of interest for storage and packaging and for determining volume and capacity of mixing equipments necessary for processing the material.

The Apparatus is designed to determine Bulk Density by allowing a sample to fall from a known height into a volumetric container. The method is often known as Bulk Density according to Böhme.

Ordering Information

EL38-7200
Bulk Density Apparatus comprising a hopper, 1 litre container and spring-loaded trap. *Weight 4.5 kg*

EL38-7200/10
Filling Ring 50 mm depth. Used with volumetric container of EL38-7200 to determine compacted density of powders. *Weight 1kg*

EL38-7200 Bulk Density Apparatus

Fly Ash (Pulverised Fuel Ash)

Fly Ash or Pulverised Fuel Ash (PFA) is a by-product of coal-fired power stations. It is a fine material with spherical particles. Uses include as an additive in composite cements, as a cementitious component in concrete and as a filler in certain types of asphalt.

Various test methods are specified in BS and EN standards and include the determination of moisture content, water requirement, strength, loss-on-ignition, initial setting time, and soundness. These tests are based on those described in BS EN196. A major requirement for Fly Ash is consistency of fineness.

Loss-on-Ignition EN 450

This method is for cement specified in EN196-2 with an ignition time of 1 hour at 975ºC.

Muffle Furnace *see Laboratory Equipment Section*

Activity Index
EN 450

The activity index is the ratio (in percent) of the compressive strength of standard mortar prisms 40 x 40 x 160 mm, prepared with 75% reference cement and 25% fly ash, to standard mortar prisms prepared with reference cement alone. The equipment required comprises that used to prepare specimens and determine their compressive strength in accordance with EN196-1.

Soundness
EN450

The expansion of a cement/fly ash paste is determined using the Le Chatelier method specified in EN196-3.
Refer to page 109.

Fineness of Fly Ash
(Wet Sieving)BS 3892-1; EN 451-2: ASTM C430

Ordering Information

EL38-7600
Spray Nozzle Apparatus comprising a spray nozzle 17.5 mm ID with 17 holes as specified in EN 451, a vacuum pressure gauge, 160 kPa graduated at 5 kPa divisions and fittings to attach the apparatus to a standard domestic water supply. Supplied without sieve. *Weight 2.1 kg*

Accessory

EL38-7600/12 **45 µm Sieve** stainless steel mesh 50 mm internal diameter.

EL38-7600 Spray Nozzle Apparatus